

line 17, delete "alike" and insert therefor  
--the same--;

line 24, delete ", the thermal" and insert  
therefor --. Thermal--;

line 25, delete "on the other hand" and insert  
therefor --takes place--.

Page 3, before line 1, insert --Summary of the  
Invention--;

lines 11-26, delete in their entirety and  
insert therefor the following:

--A galvanosorptive reaction cell is provided with  
either a membrane electrolyte cell or a liquid gap cell. Both  
cell configurations promote, without geometric modifications,  
both anion-generating and cation-generating mechanisms. With  
the sorptive liquefaction of the vapor in the solution  
generating useful work, premature substance conversion  
limitations of the galvanic reaction cell are removed in an  
advantageous way for the galvanosorptive cells. This includes,  
for example, low hydrogen solubility in liquids and the  
inability of the galvanic cell to gain a portion of the  
liquefaction heat directly as reaction work. In this way  
galvanosorptive reaction cells achieve higher energy yields and  
efficiencies than galvanic reaction cells.

According to the present invention, a galvanosorptive  
membrane electrolyte reaction cell (1) is provided for  
converting sorptive reaction work into useful electrical work by

introducing and removing a ternary substance system consisting of a vapor/carrier gas medium and a solution which absorbs the vapor. A cell housing (2) is provided which is divided by a media-sealing, galvanically separating peripheral seal (3) into a first housing part (2.1) and a second housing part (2.2). The cell housing contains a flat-shaped, porous, gas-permeable first electrode (4) and a flat-shaped, porous, gas- and liquid-permeable second electrode (5). Between the electrode faces is arranged a selectively ion-permeable membrane electrolyte (6) which forms, with the porous electrode, a mechanically stable composite unit. The first electrode face (4.2) facing away from the membrane electrolyte forms with the first housing part (2.1) a slit-shaped gas channel (7), and a vapor-saturated, ion-generating carrier gas  $[G,V]$  flows through the slit-shaped gas channel. The second electrode face faces away from the membrane electrolyte and forms with the second housing part (2.2) a slit-shaped liquid channel (8). The vapor-absorbing solution  $[S]$  flows through the slit-shaped liquid channel. The electrodes are electrically short-circuited by current lead-in and lead-off systems (9, 10) and an external load resistor (11), whereby via openings (12.1, 12.2) in the first housing part vapor-saturated carrier gas  $[G,V]_r$  with high vapor partial pressure is fed to the gas channel and a reduced quantity of vapor-saturated carrier gas  $[G,V]_m$  with reduced partial vapor pressure is carried off via openings (13.1, 13.2) in the second housing part. An undersaturated solution  $[S]_p$  with lower vapor

concentration and a low partial vapor pressure is fed to the liquid channel, and a two-phase mixture  $[S]_r$ ,  $[G,V]_p$  of undersaturated solution with raised vapor concentration and low partial vapor pressure and vapor-saturated carrier gas with the same low partial vapor pressure is carried off. Thus, when a cation-generating gas is used with a membrane electrolyte which selectively lets through this type of cation, cations are formed at the phase boundary (4.1), i.e., gas/solid/electrolyte, of the first electrode as a result of anodic oxidation with consumption of carrier gas and vapor from the gas channel. The carrier gas and vapor migrate through the membrane electrolyte to the second electrode. At the phase boundary of the second electrode (5.2), the concentration of the solution flowing in the liquid channel is increased as a result of cathodic reduction with the liberation of an equivalent quantity of carrier gas. The electrons from the first electrode flow via the current conduction systems (9, 10) and the external load-resistor (11) to the second electrode. When an anion-generating gas is used with a membrane electrolyte which selectively lets through this type of anion, anions are formed at the phase boundary of the first electrode as a result of cathodic reduction with the consumption of carrier gas and vapor from the gas channel. The anions migrate through the membrane electrolyte to the second electrode where, at the phase boundary of the second electrode the concentration of the solution flowing in the liquid channel is increased as a result of anodic oxidation with the liberation

of an equivalent quantity of carrier gas, while the electrons from the second electrode flow via the current conduction systems and the external load resistor to the first electrode.

A liquid gap cell (20) is provided for converting sorptive reaction work into useful electrical work with the introduction and removal of a ternary substance system consisting of a vapor/carrier gas mixture and a solution absorbing the vapor. This liquid gap cell comprises a cell housing (21) which is divided by a media-sealing, galvanically separating peripheral seal (22) into a first housing part (21.1) and a second housing part (21.2), and contains a slit-shaped, mechanically stable, porous, gas-permeable first electrode (23) and a flat-shaped second electrode (24) lying adjacent without a gap to the second housing part (21.2). The faces of the first housing part and the first electrode face (28.1) form a slit-shaped gas channel (25). A vapor-saturated, ion-generating carrier gas type [G,V] flows through the gas channel. The electrode faces facing one another form a slit-shaped liquid channel (26) and a vapor-absorbing, ion-conducting solution [S] flows through the liquid channel. The electrodes are electrically short-circuited by current lead-in and lead-off systems (27, 28) and an external load resistor (29). Vapor-saturated gas [G,V]<sub>r</sub> with high partial vapor pressure is fed through openings (30.1, 30.2) in the first housing part to the gas channel, and a reduced quantity of vapor-saturated carrier gas [G,V]<sub>m</sub> with reduced partial vapor pressure is carried off

via openings (31.1, 31.2) in the second housing part. An undersaturated solution [S]<sub>p</sub> with reduced vapor component concentration and a low partial vapor pressure is fed to the liquid channel, and a two-phase mixture [S]<sub>r</sub>, [G,V]<sub>p</sub> of undersaturated solution [S]<sub>r</sub> with raised vapor component concentration and vapor-saturated carrier gas [G,V]<sub>p</sub> with the same low vapor partial pressure is carried off. When a cation-generating type of gas is used, cations are formed at the phase boundary (23.2) of the first electrode as a result of anodic oxidation with the consumption of carrier gas and vapor from the gas channel. The carrier gas and vapor migrate transversely to the solution flow through the ion-conducting liquid gap (32) to the second electrode. At the phase boundary of the second electrode (24.1), the concentration of the solution flowing in the liquid channel is increased as a result of cathodic reduction with the liberation of an equivalent quantity of carrier gas. The electrons from the first electrode flow via the current conduction systems (27, 28) and the external load resistor to the second electrode. When an anion-generating type of gas is used, anions are formed at the phase boundary of the first electrode as a result of cathodic reduction with the consumption of carrier gas and vapor from the gas channel. The carrier gas and vapor migrate transversely to the solution flow through the ion-conducting liquid gap (32) to the second electrode. At the phase boundary of the second electrode (24.1), the concentration of the solution flowing in the liquid

channel is increased as a result of anodic oxidation, with the liberation of an equivalent quantity of carrier gas. The electrons from the second electrode flow via the current conduction systems and the external load resistor to the first electrode.

In principle, any vapor-absorbing solution which is thermally decomposable into a vapor component and a liquid component can be introduced and removed from a galvanosorptive reaction cell according to the present invention. For example, hydrogen is a cation-generating type of carrier gas and oxygen is an anion-generating type of carrier gas, and the substance involved in the galvanosorptive reaction process as a whole is at least a ternary substance system.--

Page 4, line 3, after "example" insert a comma; delete "the";

line 4, delete "the solution" and insert therefor --a solution of--;

between lines 9 and 10, insert the following:

--The galvanoabsorptive process taking place in the cell can be run adiabatically or non-adiabatically. In the case of non-adiabatic process, the electrode in contact with the solution or its current conduction system has channels distributed uniformly over its area through which a heat transfer medium flows. The heat-transferring walls are medium-impermeable.

In another embodiment the substance phase quantities conveyed in the circuit by media-conveying devices are measured so that in the galvanosorptive reaction process a steady increase in concentration or dilution of the solution and a steady depletion of the carrier gas is established. The overall system pressure is adjusted by the carrier gas filling the circuit. The carrier gas is at the same level as or greater than the upper partial vapor pressure reached in the ternary substance circulation.--

line 10, delete "the process features of claim 5" and insert therefor --this embodiment--;

lines 21-22, delete "According to the features of claim 4, such channels" and insert therefor --The channels described above--;

line 27, delete "according to claim 6 with the assignment of" and insert therefor --by assigning--; after "source", insert --to the electrodes--.

Page 5, between lines 6 and 7, insert the following:

--In another embodiment, a reaction cell (40) with an external load resistor (41) promotes formation of the substance fed to and carried off from the cell into an isobaric, ternary substance circuit with external thermal substance decomposition. External phase separation is effected by the allocation of a heated gas vapor enricher (42) combined with a phase separator, a solution recuperator (43), a solution cooler (44), a phase separator (45), a solution pump (46) and a gas compressor (47).

The two-phase mixture [S]r, [G,V]p carried off from the reaction cell is fed above the bottom to the phase separator where the phases [S]r and [G,V]p are separated. The vapor-depleted gas [G,V]x is fed by the gas compressor (47) to the gas vapor enricher at the bottom and in the later is conveyed towards the heated vapor-depleting solution [S]r with vapor uptake. The vapor-enriched gas [G,V]r carried off at the head of the gas vapor enricher is fed again to the reaction cell. The vapor-enriched solution [S]r carried off at the bottom from the phase separator is conveyed by the solution pump (46) through the secondary side of the solution recuperator and introduced at the head into the gas vapor enricher. The vapor-depleted solution [S]p is carried off at the bottom of the gas vapor enricher, passed through the primary side of the solution recuperator, through the solution cooler, and fed again to the reaction cell.--

line 7, delete "of claim 7" and insert therefor --described above--;

between lines 12 and 13, insert the following:

--In another embodiment, reaction cell (50) with external load resistor and connected activation source (57) is characterized by the formation of the substance flows introduced to and removed from the cell into an isobaric, ternary substance circuit with external thermal substance decomposition and external phase separation by the allocation of a heated solution



heater (51), a gas vapor enricher (52) combined with a phase separator (53), a solution pump (54) and a gas compressor (55), whereby the two-phase mixture [S]r [G,V]p carried off from the reaction cell is fed above the bottom to the phase separator (53). The phases [S]r and [G,V]p are separated, the vapor-depleted gas carried off at the head of the phase separator is united with the moderately vapor-depleted gas [G,V]m carried off from the reaction cell. The mixture [G,V]x is fed by the gas compressor (55) to the gas vapor enricher at the bottom where it is conveyed towards the heated and vapor-depleting solution [S]r with vapor uptake. The vapor-enriched gas [G,V]r carried off at the head of the gas vapor enricher is fed again to the reaction cell while the vapor-enriched solution [S]r carried off at the bottom of the phase separator is conveyed by the solution pump through the solution heater and introduced via the head into the gas vapor enricher. The vapor-depleted solution [S]p carried off at the bottom of the gas vapor enricher is fed again to the reaction cell.--

line 14, delete "of claim 8" and insert therefor --described above--;

between lines 16 and 17, insert --Brief Description of the Drawings--;

line 24, change "exemplified" to read --exemplified--.

Page 6, between lines 13 and 14, insert --Detailed Description of the Invention--.